STATE OF UTAH
DEPARTMENT OF HEALTH

NORMAN H. BANGERTER, GOVERNOR

SUZANNE DANDOY, M.D., M.P.H., EXECUTIVE DIRECTOR

June 3, 1985
533-6146

RECEIVED

JUN 05 1985

DIVISION OF OIL
GAS & MINING

Mr. Bob Renaud
St. George Mining Corporation
Suite 201
50 East 100 South
St. George, Utah 84770

RE: Apex Project
Leak Detection System

Dear Mr. Renaud:

We understand from phone conversations that the installation of the liners in the ponds has commenced. Please be advised that the liner systems have not been approved and should not be installed until an acceptable system has been agreed upon.

We have reviewed the plan and specifications submitted by your engineer regarding the synthetic liner for the tailings impoundment, the crystal pond, and the still sludge pond.

The synthetic liner previously agreed upon, installed as indicated on page 2 of the specifications for installation of synthetic liners for waste impoundment facilities at the Apex Project dated May 1985 for the still sludge pond is acceptable.

However, it is the position of this office that a leak detection system must be provided for each pond that is constructed. This position is substantiated by a comparison between the waste flow constituents as listed in table 2.3 transmitted to this bureau in a May 20, 1985 letter from your engineer (copy attached) and the summary of the analysis of the six groundwater samples from attachment A.1.3 of the appendices to preliminary design of waste handling and disposal facilities for the Apex Project Report 02903/12 (copy attached) summarized below. By reviewing the chart it can be easily seen that the potential for pollution and degradation of the groundwater is a real possibility if a leak occurrs.

General Parameters	Solution Phase of Solid Waste Slurry Tails MG/L	Ferrous Sulfate Solution From Solvent Extractions MG/L	Ground Water Quality Analysis (Highest Value) MG/L
TDS	22,000.0 ±	200,000.0 ±	3044.0
Sulfate (SO_4)	12,000.0	135,000.0	1932.0
Chloride (Cl)	0.0	100.0	64.0
Nitrogen Ammonia (NH_3)	6,000.0	5,900.0	0.05
Arsenic (As)	60.0	10.0	0.01
Cadmium (Cd)	1.0	1.0	0.01
Copper (Cu)	140.0	1.0	0.01
Iron (Fe)	4160.0	66,000.0	1.43
Lead (Pb)	0.01	5.0	0.01
Nickel (Ni)	2.0	80.0	0.05
Silver (Ag)	1.0	1.0	0.01
Zinc (Zn)	130.0	10.0	0.03
Magnesium (Mg)	400.0	7600.0	170.0
Potassium (K)	5.0	50.0	4.5
Sodium (Na)	500.0	500.0	97.0

This office recognizes the benefits which have been mentioned in the report due to soil attenuation, however, we are certain these benefits are not sufficient to prevent the degradation of groundwater should a leak occur.

Therefore, it is the position of the Bureau of Water Pollution Control that a leak detection system must be provided for each lined pond. We feel that a leak detection system is essential because of the wastewater constituents as previously noted, the liner has not previously been used in Utah and the quality control of this type of liner is not as good as a prefabricated liner.

Please call if there are any questions.

Sincerely,

UTAH WATER POLLUTION CONTROL COMMITTEE

Jay B Patten

Calvin K. Sudweeks
Executive Secretary

CGD:tf
Enclosures
cc: Dee Wilcox, Bureau of Indian Affairs, Cedar City
Rob Dorey, Steffen, Robertson and Kirsten, Lakewood, CO
Wayne Thomas, Southwestern District Health Department
Steve Labrum, Southwestern District Health Department
John Whitehead, Division of Oil, Gas and Mining

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TABLE 2.3

CHEMICAL TESTING OF APEX PROCESSED WASTE

	Solid Waste Tails ppm	Solution Phase of Solid Waste Slurry Tails ppm	(1) Waste Slurry From Ge Distillation ppm	(2) Ferrous Sulfate Solution From Solvent Extraction ppm
Fe	900	4,160	20,000	66,000
Mn	10	2	10	60
Ag	3	<1	<1	<1
Ni	20	2	10	80
Cd	<10	<1	<1	<1
Pb	1,300	0.01	5	5
Zn	10	130	10	10
Cr^{+6}	<1	<1	<1	<1
Cr (Total)	120	<1	10	10
Cu	10	140	500	<1
As	50	60	14,000 *	10
Hg	20	<0.1	<0.1	<1
Se	4	<0.05	<0.05	<0.05
Tl	80	<0.5	<0.5	3
Ca	8,000	400	100	400
Mg	500	400	2,400	7,600
Na	500	500	75,500	500
K	50	5	50	50
NH_3	1,000	6,000	1,800	5,900
$SO_4^=$	16,000	12,000	120,000	135,000
Cl^-	100	0	57,000	100
CN^T	<0.1	<0.01	<0.01	<0.01
CN free	<0.1	<0.01	<0.01	<0.01

DRAFT

* Arsenic will be as $FeAsO_4 \cdot 2H_2O$ prior to entering pond.

CORE LABORATORIES, INC.
ANALYTICAL REPORT

11-OCT-83

STEFFEN ROBERTSON AND KIRSTEN
APEX PROJECT

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W83385 - 1	W83385 - 2	W83385 - 3	W83385 - 4	W83385 - 5	W83385 - 6
SAMPLE ID:	ASW-2 #1	ASW-2 #2	ASW-2 #3	ASW-3 #1	ASW-3 #2	ASW-3 #3
SAMPLE REMARKS:						
GENERAL PARAMETERS						
TOTAL DISSOLVED SOLIDS (CALC.)	3044	3021	3051 (2880)	3037	3046	3013 (2904)
TOTAL SUSPENDED SOLIDS			8			7
BICARBONATE (HCO3)	236.0	229.0	242.0	224.0	236.0	233.0
CARBONATE (CO3)	<1	<1	<1	<1	<1	<1
HYDROXIDE (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SULFATE (SO4)			1906			1932
CHLORIDE (Cl)	58.7	59.1	59.1	64.1	64.7	64.1
*TOTAL ALK. (pH 3.7 as CaCO3)	206	203	215	210	212	205
*ACIDITY (pH 8.3 AS CaCO3)			<5			<5
*PHOSPHATE, TOTAL (PO4-P)			0.05			0.09
*NITROGEN, AMMONIA (NH3-N)			<0.05			<0.05
*NITROGEN, NITRATE (NO3-N)			2.9			0.1
*FLUORIDE (F)			0.6			0.5
*SULFIDE (S)			<0.02			<0.02
*SODIUM ABSORPT. RATIO (SAR)			3.93			5.06

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations or profitableness of any oil, gas, coal or other mineral, property, well or sand in connection with which such report is used or relied upon.

CORE LABORATORIES, INC.
ANALYTICAL REPORT

11-OCT-83

STEFFEN ROBERTSON AND KIRSTEN
PEX PROJECT

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W83385 - 1	W83385 - 2	W83385 - 3	W83385 - 4	W83385 - 5	W83385 - 6
SAMPLE ID:	ASW-2 #1	ASW-2 #2	ASW-2 #3	ASW-3 #1	ASW-3 #2	ASW-3 #3
SAMPLE REMARKS:						
ISSOLVED METALS						
LUMINUM (Al)			<0.1			<0.1
NTIMONY (Sb)			<0.01			<0.01
RSENIC (As)			<0.01			<0.01
ERYLLIUM (Be)			<0.01			<0.01
ORON (B)			0.38			0.48
ADMIUM (Cd)			<0.01			<0.01
ALCIUM (Ca)	540	530	540	520	510	520
OPPER (Cu)			0.01			0.01
RON (Fe)			1.43			0.52
EAD (Pb)			<0.01			<0.01
AGNESIUM (MG)			170			170
ANGANESE (Mn)			0.01			0.04
ERCURY (Hg)--ug./l.			<0.3			<0.3
OLYBDENUM (Mo)			<0.1			<0.1
ICKEL (Ni)			<0.05			<0.05
OTASSIUM (K)			4.3			4.6
ELENIUM (Se)			<0.01			<0.01
ILVER (Ag)			<0.01			<0.01
ODIUM (Na)	75	74	74	97	96	95
INC (Zn)			0.03			0.03

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CORE LABORATORIES, INC.
ANALYTICAL REPORT

11-OCT-83

STEFFEN ROBERTSON AND KIRSTEN
APEX PROJECT

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W83385 - 1	W83385 - 2	W83385 - 3	W83385 - 4	W83385 - 5	W83385 - 6
SAMPLE ID:	ASW-2 #1	ASW-2 #2	ASW-2 #3	ASW-3 #1	ASW-3 #2	ASW-3 #3
SAMPLE REMARKS:						
TOTAL METALS						
CALCIUM (Ca), total			540			520
MAGNESIUM (Mg), total			170			170
POTASSIUM (K), total			4.4			4.5
SODIUM (Na), total			74			94

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